Thermo Fisher Scientific

FIBER*Lite*™ F15-8x50c

Instruction manual

50120015-1 June 2009

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FIBER*Lite*™ F15-8x50c

Instruction Manual

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Preface

Before starting to use the rotor, read through these Operating Instructions carefully and follow the instructions.

The information contained in these Operating Instructions is the property of Thermo Fisher Scientific; it is forbidden to copy or pass on this information without explicit approval.

Failure to follow the instructions and safety information in this instruction manual will result in the expiration of the seller's warranty.

Scope of Supply

Article Number		Quantity	Check
75003663	FIBER*Lite* ™ F15-8x50c	1	☐
76003500	Rubber seal grease	1	☐
70009824	Anti-corrosion oil	1	☐
50120015	Instruction Manual	1	☐

If any parts are missing, please contact the nearest Thermo Fisher Scientific representative.

Precautions

In order to ensure safe operation of the FIBER*Lite* ™ F15-8x50c, the following general safety regulations must be followed:

- Do not remove the magnet at the rotor bottom
- Do not use rotors which show any signs of corrosion and/or cracks.
- Use only with rotors that have been loaded properly.
- Never overload the rotor.

- Use only accessories which have been approved by Thermo Fisher Scientific. Exceptions to this rule are commercially available glass or plastic centrifuge tubes, provided they have been approved for the speed or the RCF value of the rotor.
- Please observe the safety instructions.

Please pay particular attention to the following aspects:

- Rotor installation: Check that the rotor is locked properly into place before operating the centrifuge.
- Always balance the samples.

Maximum sample density at maximum speed: $1{,}2\frac{g}{ml}$

This symbol refers to general hazards.
ATTENTION means that material damage could occur.
WARNING means that injuries or material damage or contamination could occur.

This symbol refers to biological hazards.
Observe the information contained in the instruction manual to keep yourself and your environment safe.

Rotor Specification

Contents

- "Heraeus" on page 1-2
- "Sorvall" on page 1-4

Heraeus

Table 1-1.230V 50Hz/60Hz ventilated

Centrifuge	Heraeus Multifuge X3	Heraeus Multifuge X3F	Heraeus Multifuge X1
Catalog #	75004500	75004530	75004210
Weight empty [kg] of rotor	4.44	4.44	4.44
Maximum permissible load [g]	8x75	8x75	8x75
maximum speed n_{max} [rpm]	14500	14500	14500
maximum RCF value at n_{max}	24446	24446	24446
max. / min. radius [cm]	4.3 / 10.4	4.3 / 10.4	4.3 / 10.4
Pitch angle [°]	25	25	25
Accel. / braking time [s]	75 / 65	75 / 65	80 / 80
sample heating at n_{max} [° C] referred to ambient temperature of 23 °C, running time 60 minutes	21	21	21
aerosol-tight	no	no	no
max temperature for autoclaving °C	121	121	121

Table 1-2. 230V 50Hz/60Hz refrigerated

Centrifuge	Heraeus Multifuge X3R	Heraeus Multifuge X3FR	Heraeus Multifuge X1R
Catalog #	75004515	75004536	75004250
Weight empty [kg] of rotor	4.44	4.44	4.44
Maximum permissible load [g]	8x75	8x75	8x75
maximum speed n_{max} [rpm]	14500	14500	14500
maximum RCF value at n_{max}	24446	24446	24446
max. / min. radius [cm]	4.3 / 10.4	4.3 / 10.4	4.3 / 10.4
Pitch angle [°]	25	25	25
Accel. / braking time [s]	75 / 65	75 / 65	80 / 80
aerosol-tight	no	no	no
max temperature for autoclaving °C	121	121	121

Table 1-3. 120V 60Hz ventilated

Centrifuge	Heraeus Multifuge X3	Heraeus Multifuge X3F	Heraeus Multifuge X1
Catalog #	75004501	75004531	75004211
Weight empty [kg] of rotor	4.44	4.44	4.44
Maximum permissible load [g]	8x75	8x75	8x75
maximum speed n_{max} [rpm]	14500	14500	14000
maximum RCF value at n_{max}	24446	24446	22789
max. / min. radius [cm]	4.3 / 10.4	4.3 / 10.4	4.3 / 10.4
Pitch angle [°]	25	25	25
Accel. / braking time [s]	95 / 65	95 / 65	100 / 80
sample heating at n_{max} [° C] referred to ambient temperature of 23 °C, running time 60 minutes	21	21	21
aerosol-tight	no	no	no
max temperature for autoclaving °C	121	121	121

Table 1-4. 120V 60Hz refrigerated

Centrifuge	Heraeus Multifuge X3R	Heraeus Multifuge X3FR	Heraeus Multifuge X1R
Catalog #	75004516	75004537	75004251
Weight empty [kg] of rotor	4.44	4.44	4.44
Maximum permissible load [g]	8x75	8x75	8x75
maximum speed n_{max} [rpm]	14500	14500	14000
maximum RCF value at n_{max}	24446	24446	22789
max. / min. radius [cm]	4.3 / 10.4	4.3 / 10.4	4.3 / 10.4
Pitch angle [°]	25	25	25
Accel. / braking time [s]	85 / 85	85 / 85	100 / 80
aerosol-tight	no	no	no
max temperature for autoclaving °C	121	121	121

Sorvall

Table 1-5. 230V 50Hz/60Hz ventilated

Centrifuge	Sorvall Legend XT	Sorvall Legend XF	Sorvall Legend X1
Catalog #	75004505	75004532	75004220
Weight empty [kg] of rotor	4.44	4.44	4.44
Maximum permissible load [g]	8x75	8x75	8x75
maximum speed n_{max} [rpm]	14500	14500	14500
maximum RCF value at n_{max}	24446	24446	24446
max. / min. radius [cm]	4.3 / 10.4	4.3 / 10.4	4.3 / 10.4
Pitch angle [°]	25	25	25
Accel. / braking time [s]	75 / 65	75 / 65	80 / 80
sample heating at n_{max} [° C] referred to ambient temperature of 23 °C, running time 60 minutes	21	21	21
aerosol-tight	no	no	no
max temperature for autoclaving °C	121	121	121

Table 1-6. 230V 50Hz/60Hz refrigerated

Centrifuge	Sorvall Legend XTR	Sorvall Legend XFR	Sorvall Legend X1R
Catalog #	75004520	75004538	75004260
Weight empty [kg] of rotor	4.44	4.44	4.44
Maximum permissible load [g]	8x75	8x75	8x75
maximum speed n_{max} [rpm]	14500	14500	14500
maximum RCF value at n_{max}	24446	24446	24446
max. / min. radius [cm]	4.3 / 10.4	4.3 / 10.4	4.3 / 10.4
Pitch angle [°]	25	25	25
Accel. / braking time [s]	75 / 65	75 / 65	80 /80
aerosol-tight	no	no	no
max temperature for autoclaving °C	121	121	121

Table 1-7. 120V 60Hz ventilated

Centrifuge	Sorvall Legend XT	Sorvall Legend XF	Sorvall Legend X1
Catalog #	75004506	75004533	75004221
Weight empty [kg] of rotor	4.44	4.44	4.44
Maximum permissible load [g]	8x75	8x75	8x75
maximum speed n_{max} [rpm]	14500	14500	14000
maximum RCF value at n_{max}	24446	24446	22789
max. / min. radius [cm]	4.3 / 10.4	4.3 / 10.4	4.3 / 10.4
Pitch angle [°]	25	25	25
Accel. / braking time [s]	95 / 65	95 /65	100 / 80
sample heating at n_{max} [° C] referred to ambient temperature of 23 °C, running time 60 minutes	21	21	21
aerosol-tight	no	no	no
max temperature for autoclaving °C	121	121	121

Table 1-8. 120V 60Hz refrigerated

Centrifuge	Sorvall Legend XTR	Sorvall Legend XFR	Sorvall Legend X1R
Catalog #	75004521	75004539	75004261
Weight empty [kg] of rotor	4.44	4.44	4.44
Maximum permissible load [g]	8x75	8x75	8x75
maximum speed n_{max} [rpm]	14500	14500	14000
maximum RCF value at n_{max}	24446	24446	22789
max. / min. radius [cm]	4.3 / 10.4	4.3 / 10.4	4.3 / 10.4
Pitch angle [°]	25	25	25
Accel. / braking time [s]	85 / 65	85 /65	100 / 80
aerosol-tight	no	no	no
max temperature for autoclaving °C	121	121	121

Table 1-9. 100V 50Hz/60Hz ventilated

Centrifuge	Sorvall Legend XT	Sorvall Legend XF	Sorvall Legend X1
Catalog #	75004507	75004534	75004223
Weight empty [kg] of rotor	4.44	4.44	4.44
Maximum permissible load [g]	8x75	8x75	8x75
maximum speed n_{max} [rpm]	14500	14500	13500
maximum RCF value at n_{max}	24446	24446	21191
max. / min. radius [cm]	4.3 / 10.4	4.3 / 10.4	4.3 / 10.4
Pitch angle [°]	25	25	25
Accel. / braking time [s]	110 / 65	110 / 65	110 / 75
sample heating at n_{max} [° C] referred to ambient temperature of 23 °C, running time 60 minutes	21	21	
aerosol-tight	no	no	no
max temperature for autoclaving °C	121	121	121

Table 1-10. 100V 50Hz/60Hz refrigerated

Centrifuge	Sorvall Legend XTR	Sorvall Legend XFR	Sorvall Legend X1R
Catalog #	75004522	75004540	75004263
Weight empty [kg] of rotor	4.44	4.44	4.44
Maximum permissible load [g]	8x75	8x75	8x75
maximum speed n_{max} [rpm]	14500	14500	14500
maximum RCF value at n_{max}	24446	24446	24446
max. / min. radius [cm]	4.3 / 10.4	4.3 / 10.4	4.3 / 10.4
Pitch angle [°]	25	25	25
Accel. / braking time [s]	85 / 65	85 / 65	100 / 80
aerosol-tight	no	no	no
max temperature for autoclaving °C	121	121	121

Accessories

Contents

- „Rotor data“ on page 2-2
- „Accessories“ on page 2-2

F15-8x50c Fixed Angle Carbon Fiber Rotor

Rotor Specifications	
Capacity (ml)	8 x 50 conical
Tube Dimensions (mm)	30 x 121
Angle °	25
Maximum Speed (rpm)	14,500
K Factor	1,062
Net Weight (kg)	4.4

RCF/Radius	RCF (x g)	Radius (cm)
Maximum	24,446	10.4
Minimum	10,098	4.3

F15-8x50c Carbon Fiber Rotor

Cat. No.	Description
75003663	F15-8x50c Carbon Fiber Rotor

Accessories

Cat. No.	Description
099-085077	Replacement Lid Assembly
021-085077	O-ring Refresher Kit

Tube Ordering Information

Cat. No.	Tube Vol. (ml)	Vol. Fill (ml)	Description	Qty.	Max. Speed (rpm)	Dims ØxL (mm)	Sealing Assembly Required:			Adapters Required:			Accessories Required:	
							Cat. No.	Qty /Pkg	Description	Cat. No.	Qty /Pkg	No. of Places		
334959	50	50	Nunc Conical	25	14,500	30x115	Included	25	PP Sealing	-	-	-	-	-
366036	15	15	Nunc Conical	50	-	17x120	Included	50	PP Sealing	75100378	2	1	-	-

AutoLock™

Contents

- "Rotor Installation" on page 3-2
- "Removing the Rotor" on page 3-3

Rotor Installation

CAUTION Unapproved or incorrectly combined accessories can cause serious damage to the centrifuge.

This rotor is equipped with an AutoLock™-system.

This system is used to automatically lock the rotor to the centrifuge spindle. The rotor does not have to be bolted onto the centrifuge spindle.

Proceed as follows:

1. Open the lid of the centrifuge and if necessary remove any dust, foreign objects or residue from the chamber.
   AutoLock™ and o-ring must be clean and undamaged.

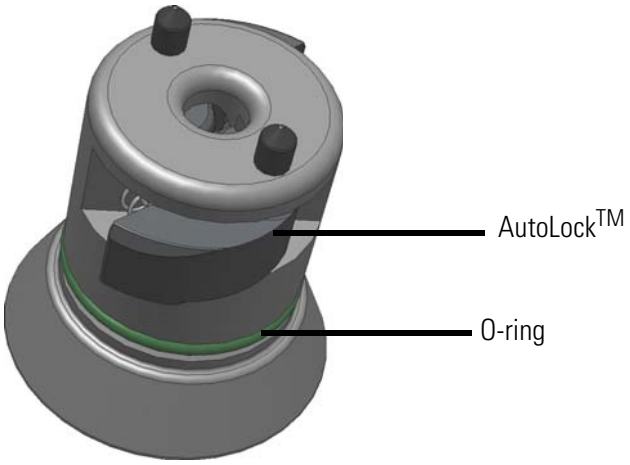


Figure 1. AutoLock™

2. Hold the rotor over the centrifuge spindle and let it slide slowly down the centrifuge spindle. The rotor clicks automatically into place.

CAUTION Do not force the rotor onto the centrifuge spindle.
If the rotor is very light, then it may be necessary to press it onto the centrifuge spindle with a small amount of pressure.

3. Check if the rotor is properly installed by lifting slightly on the handle. If the rotor can be pulled up, then it must be reclamped to the centrifuge spindle.

WARNUNG If the rotor cannot be properly locked in place after several attempts, then the AutoLock™ is defective and you are not permitted to operate the rotor.
Check for any damage to the rotor, damaged rotors must not be used.
Keep the hub area clear of objects.

CAUTION Check that the rotor is properly locked on the centrifuge spindle before each use by pulling it a its handle.

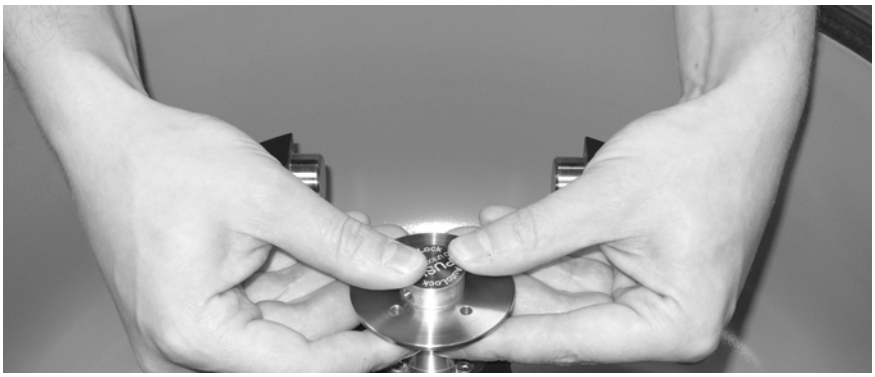
Be sure to check all seals before starting any aerosol-tight applications.

4. Close the centrifuge door.

Removing the Rotor

To remove the rotor, proceed as follows:

1. Open the centrifuge door.
2. Grab the rotor handle with both hands and press against the green AutoLock™ button. At the same time, pull the rotor directly upwards with both hands and remove it from the centrifuge spindle. Make sure not to jam the rotor while doing this.



Rotor Loading

Contents

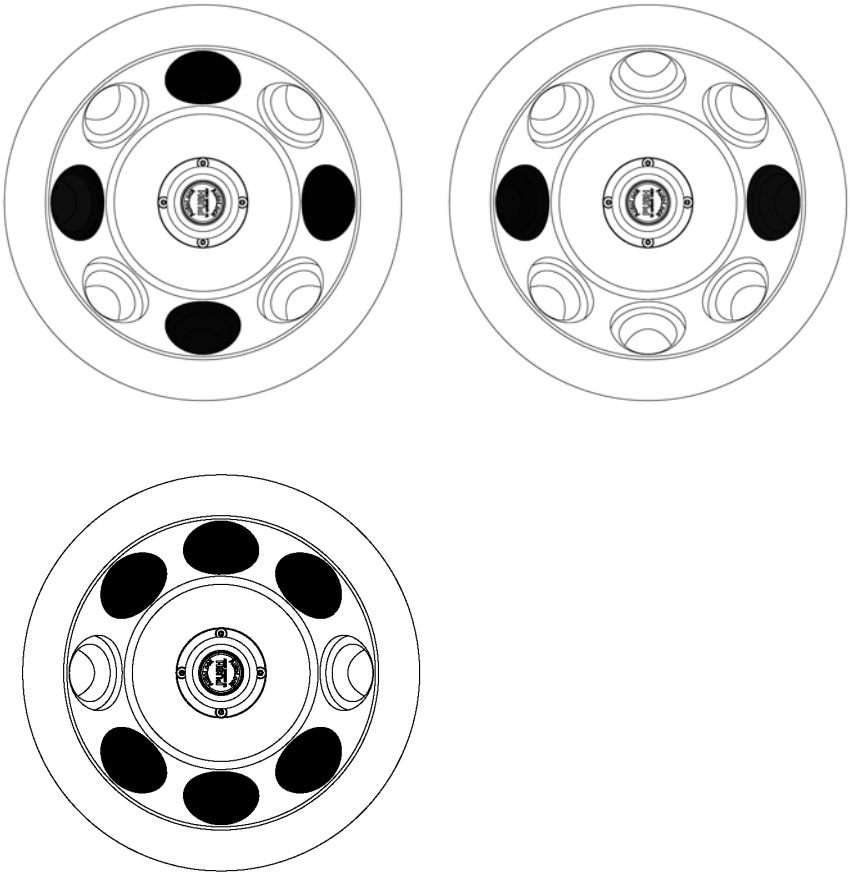
- "Before Run" on page 4-2
- "Proper Loading" on page 4-2
- "Improper Loading" on page 4-3
- "Maximum Loading" on page 4-4

Before Run

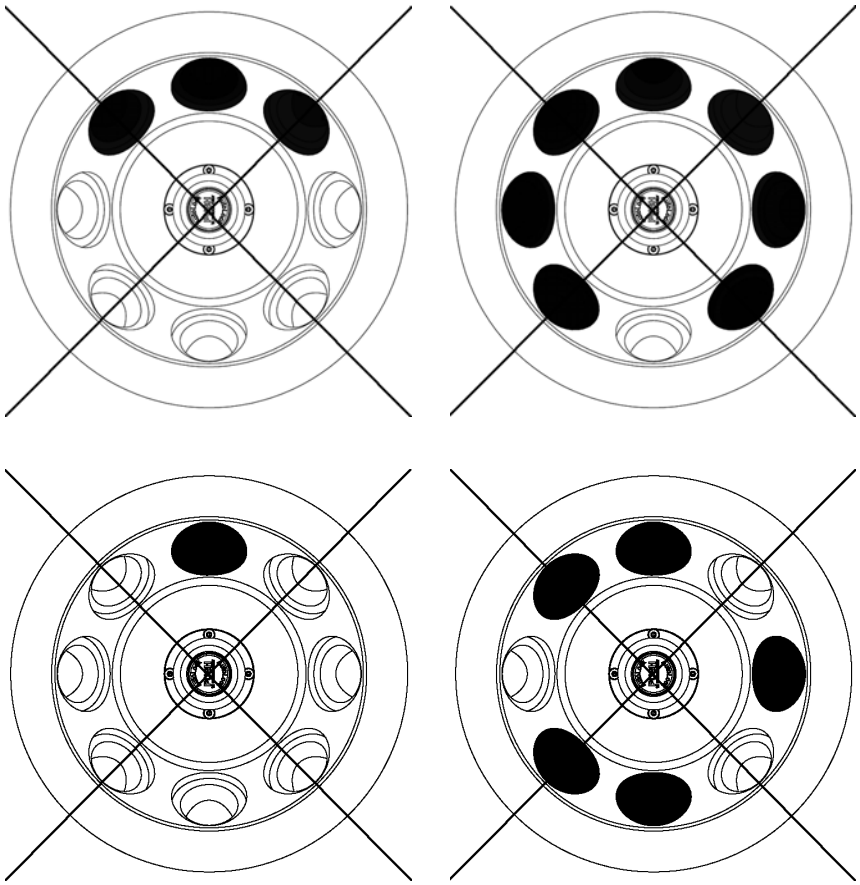
1. Please read and observe the safety instructions contained in these operating instructions and in the instructions for use.
2. Check the rotor and all accessory parts for damages such as cracks, scratches or traces of corrosion.
3. Check the rotor chamber, the centrifuge spindle and the AutoLock™.
4. Check the rotor's suitability using the chemical compatibility chart on page B-1.
5. Make sure the tubes or bottles do not touch the lid.

Proper Loading

To ensure safe operation of the centrifuge, the rotor must be evenly loaded at all times.



Improper Loading



Maximum Loading

The rotor can run at high speeds. The rotor design has sufficient reserve stability even when spinning at top speed.

The safety system of the centrifuge requires that you symetrically balance the tubes in the rotor. This refers to each cavity.

There are two options available for centrifuging samples whose weight, including adaptor, exceeds the maximum permissible load:

- Reduce the fill level.
- Reduce the speed.
  Use this formular:

$$n_{adm} = n_{max}\sqrt{\frac{\text{Maximum permissible load}}{\text{Effective load}}}$$

n_{adm} = admissible speed
n_{max} = maximum speed

Aerosol-tight Applications

Contents

- "Basic Principles" on page 5-2
- "Fill Level" on page 5-2
- "Checking the Aerosol-Tightness" on page 5-2

Basic Principles

CAUTION When centrifuging hazardous samples, do not open aerosol-tight rotors or buckets unless placed in a safety cabinet.
Always bear in mind the maximum permitted fill levels.

Be sure to check all seals before starting any aeorsol-tight applications.

- Check that the sample containers are well suited for the desired centrifugation process.

Fill Level

The tubes are only to be filled to a level which ensures that the sample is unable to reach the top of the tube during centrifugation. Therefore fill the tube only 2/3 of the rated level.

Checking the Aerosol-Tightness

The aerosol tightness testing of the rotors and buckets depend on the microbiological test process in accordance with the EN 61010-2-020 Appendix AA.

Whether or not a rotor is aerosol-tight depends primarily on proper handling.

Check as needed to make sure your rotor is aerosol-tight.

The careful inspection of the seals and seal surfaces for signs of wear and damage such as cracks, scratches and embrittlement is extremely important.

Aerosol-tight applications are not possible if the lids are open.

Aerosol-tightness requires the correct operation when filling the sample vessels and closing the rotor lid.

Quick Test

As a quick test, it is possible to test the aerosol-tightness of fixed-angle rotors using the following process:

1. Lubricate all seals lightly.
   Always use the special grease 7600 3500 when lubricating the seals.
2. Fill the cavities with approx. 10 ml of carbonated mineral water.
3. Close the rotor as explained in the handling instructions.
4. Shake the rotor vigorously using your hands.
   This releases the carbonic acid gas which is bound in the water, resulting in excess pressure. Do not apply pressure to the lid when doing so.

   Leaks can be detected by escaping water or the sound of escaping gas.

Replace the seals if you detect any leaks. Then repeat the test.

5. Dry the rotor, rotor lid and the cover seal.

CAUTION Prior to each use, the seals in the rotor are to be inspected in order to assure that they are correctly seated and are not worn or damaged.
Damaged seals are to be replaced immediately.
When loading the rotor, ensure that the rotor lid closes securely.
Damaged or clouded rotor covers are to be replaced immediately.

Maintenance and Care

Contents

- "Intervals" on page 6-2
- "Cleaning" on page 6-2
- "Disinfection" on page 6-2
- "Handling and Care of Rotors and Accessories made of Aluminum" on page 6-3
- "Decontamination" on page 6-4
- "Decontamination" on page 6-4
- "Autoclaving" on page 6-4
- "Service of Thermo Fisher Scientific" on page 6-5

Intervals

For the sake of personal, environmental, and material protection, it is your duty to clean and if necessary disinfect the rotor on a regular basis.

Maintenance	Recommended interval
Clean rotor	Daily or after every use
Accessories	Daily or after every use

CAUTION Before using any other cleaning or decontamination process other than that recommended by Thermo Fisher Scientific is applied, the user should check with Thermo Fisher Scientific that the planned process does not damage the device.
Use only approved cleansers.
If in doubt, contact Thermo Fisher Scientific

Cleaning

1. Open the centrifuge.
2. Turn off the centrifuge.
3. Pull out the power supply plug.
4. Grasp the rotor with both hands and lift it vertically off the centrifuge spindle.
5. Remove the centrifuge tubes and adaptors.
6. Use a neutral cleaning agent with a pH value between 6 and 8 for cleaning.
7. Dry all of the aluminum parts after cleaning with a cloth or in a warm air cabinet at a maximum temperature of 50°C.

CAUTION When cleaning, do not allow liquids, especially organic solvents, to get on the drive shaft or the bearings inside the centrifuge.
Organic solvents break down the grease in the motor bearing. The drive shaft could freeze up.

Disinfection

Disinfect the rotor immediately whenever infectious material has spilled during centrifuging.

WARNUNG Infectious material can get into the centrifuge when a tube breaks or as a result of spills. Keep in mind the risk of infection when touching articles and take all necessary precautions.
In case of contamination, make sure that others are not put at risk.
Decontaminate the affected parts immediately.
Take other precautions if need be.

The rotor chamber and the rotor should be treated preferably with a neutral disinfectant. A disinfectant spray would be most suitable for this purpose so that the rotor and accessory surfaces are covered evenly.

WARNUNG Observe the safety precautions and handling instructions for the cleaning agents used.

Contact the service department of Thermo Fisher Scientific for questions regarding the use of other disinfectants.

Disinfect the rotor and accessories as follows:

1. Open the centrifuge.
2. Turn off the centrifuge.
3. Pull out the power supply plug.
4. Grasp the rotor with both hands and lift it vertically off the centrifuge spindle.
5. Remove the centrifuge tubes and adaptors and dispose of them or disinfect them.
6. Treat the rotor and rotor lid according to the instructions for the disinfectant (spray or soak in solution). Adhere strictly to the given application times.
7. Be sure the disinfectant can drain off the rotor.
8. Rinse the rotor and rotor lid thoroughly with water and then rub down.
9. Dispose of the disinfectant according to the applicable guidelines.
10. Treat aluminum rotors afterwards with an anti-corrosion oil (7000 9824). Apply a thin layer of oil using a soft cloth.

Handling and Care of Rotors and Accessories made of Aluminum

The aluminum parts are anodised and protected against corrosion to a large extent. Avoid damaging the surface of aluminum parts in order to lengthen their lifetime.

Clean aluminum parts as follows:

- Use warm water with a neutral solvent.
- Never use caustic cleaning agents such as soap suds, phosphoric acid, bleaching solutions or scrubbing powder.
- Rinse the cavities out thoroughly.
- Use a soft brush without metal bristles to remove stubborn residue.
- Afterwards rinse with distilled water and dry the parts off with a soft cloth.
- Place the rotors on a plastic grate with their cavities pointing down.
- If drying boxes are used, the temperature must never exceed 50 °C, since higher temperatures could damage the material and shorten the lifetime of the parts.

- Use only disinfectants with a pH of 6-8.
- After cleaning, treat the entire surface of aluminum parts with corrosion protection oil (7000 9824).
- Also treat the cavities with oil.
- Store the aluminum parts at room temperature or in a cold-storage room with the cavities pointing down.

The following substances will attack the aluminum parts:

- Bases, in concentrated and diluted form
- Alkaline amines
- Alkaline soap solutions
- Strong acids
- Tannic acid, oxalic acid, trichloraceticacid
- Solutions with mercury, copper and other heavy metal ions (also trace amounts)
- Anhydrous chlorinated solvents
- Salt water

Clean the aluminum parts thoroughly whenever they come into contact with these substances.

Decontamination

For general radioactive decontamination use a solution of equal parts of 70% ethanol, 10% SDS and water. Rinse the rotor first with ethanol and then with de-ionized water. Dry off the rotor with a soft cloth.

Dispose of all rinsing solutions in a container suitable for radioactive waste.

Autoclaving

Autoclaving is permitted.

Rotors and adapters can be autoclaved at 121 °C.

The permissible autoclave cycle is 20 min.

Clean the rotor before autoclaving and rinse it with distilled water. Remove all accessories (tubes, adaptors) from the rotor.

No chemical additives are permitted in the steam.

CAUTION Never exceed the permitted temperature and duration when autoclaving. If the rotor shows signs of corrosion or wear, it must be replaced.

Service of Thermo Fisher Scientific

Thermo Fisher Scientific recommends having the centrifuge and accessories serviced once a year by an authorized service technician. The service technicians check the following:

- the electrical equipment
- the suitability of the set-up site
- the lid lock and the safety system
- the rotor
- the mated parts of the rotor and the drive shaft

Defective material is replaced.

Thermo Fisher Scientific offers inspection and service contracts for this work.

This presupposes, however, that all prior service to the centrifuge has exclusively been done by a Thermo Fisher Scientific authorized service technician.

RCF-Values

Speed (rpm)	R_{min}	R_{max}	RCF R_{min}	RCF R_{max}
300	4.3	10.4	4	10
400	4.3	10.4	8	19
500	4.3	10.4	12	29
600	4.3	10.4	17	42
700	4.3	10.4	24	57
800	4.3	10.4	31	74
900	4.3	10.4	39	94
1000	4.3	10.4	48	116
1100	4.3	10.4	58	141
1200	4.3	10.4	69	167
1300	4.3	10.4	81	196
1400	4.3	10.4	94	228
1500	4.3	10.4	108	262
1600	4.3	10.4	123	298
1700	4.3	10.4	139	336
1800	4.3	10.4	156	377
1900	4.3	10.4	174	420
2000	4.3	10.4	192	465
2100	4.3	10.4	212	513
2200	4.3	10.4	233	563
2300	4.3	10.4	254	615
2400	4.3	10.4	277	670
2500	4.3	10.4	300	727
2600	4.3	10.4	325	786
2700	4.3	10.4	350	848
2800	4.3	10.4	377	912
2900	4.3	10.4	404	978
3000	4.3	10.4	433	1046

Speed (rpm)	R_{min}	R_{max}	RCF R_{min}	RCF R_{max}
3100	4.3	10.4	462	1117
3200	4.3	10.4	492	1191
3300	4.3	10.4	524	1266
3400	4.3	10.4	556	1344
3500	4.3	10.4	589	1424
3600	4.3	10.4	623	1507
3700	4.3	10.4	658	1592
3800	4.3	10.4	694	1679
3900	4.3	10.4	731	1768
4000	4.3	10.4	769	1860
4100	4.3	10.4	808	1955
4200	4.3	10.4	848	2051
4300	4.3	10.4	889	2150
4400	4.3	10.4	931	2251
4500	4.3	10.4	973	2355
4600	4.3	10.4	1017	2460
4700	4.3	10.4	1062	2568
4800	4.3	10.4	1108	2679
4900	4.3	10.4	1154	2792
5000	4.3	10.4	1202	2907
5100	4.3	10.4	1250	3024
5200	4.3	10.4	1300	3144
5300	4.3	10.4	1350	3266
5400	4.3	10.4	1402	3390
5500	4.3	10.4	1454	3517
5600	4.3	10.4	1508	3646
5700	4.3	10.4	1562	3778
5800	4.3	10.4	1617	3911
5900	4.3	10.4	1673	4047
6000	4.3	10.4	1731	4186
6100	4.3	10.4	1789	4326
6200	4.3	10.4	1848	4469
6300	4.3	10.4	1908	4615
6400	4.3	10.4	1969	4763
6500	4.3	10.4	2031	4912
6600	4.3	10.4	2094	5065
6700	4.3	10.4	2158	5219

Speed (rpm)	R_{min}	R_{max}	RCF R_{min}	RCF R_{max}
6800	4.3	10.4	2223	5376
6900	4.3	10.4	2289	5536
7000	4.3	10.4	2356	5697
7100	4.3	10.4	2423	5861
7200	4.3	10.4	2492	6028
7300	4.3	10.4	2562	6196
7400	4.3	10.4	2633	6367
7500	4.3	10.4	2704	6540
7600	4.3	10.4	2777	6716
7700	4.3	10.4	2850	6894
7800	4.3	10.4	2925	7074
7900	4.3	10.4	3000	7257
8000	4.3	10.4	3077	7441
8100	4.3	10.4	3154	7629
8200	4.3	10.4	3232	7818
8300	4.3	10.4	3312	8010
8400	4.3	10.4	3392	8204
8500	4.3	10.4	3473	8401
8600	4.3	10.4	3556	8599
8700	4.3	10.4	3639	8801
8800	4.3	10.4	3723	9004
8900	4.3	10.4	3808	9210
9000	4.3	10.4	3894	9418
9100	4.3	10.4	3981	9628
9200	4.3	10.4	4069	9841
9300	4.3	10.4	4158	10056
9400	4.3	10.4	4248	10274
9500	4.3	10.4	4339	10494
9600	4.3	10.4	4430	10716
9700	4.3	10.4	4523	10940
9800	4.3	10.4	4617	11167
9900	4.3	10.4	4712	11396
10000	4.3	10.4	4807	11627
10100	4.3	10.4	4904	11861
10200	4.3	10.4	5002	12097
10300	4.3	10.4	5100	12335
10400	4.3	10.4	5200	12576

Speed (rpm)	R_{min}	R_{max}	RCF R_{min}	RCF R_{max}
10500	4.3	10.4	5300	12819
10600	4.3	10.4	5402	13064
10700	4.3	10.4	5504	13312
10800	4.3	10.4	5607	13562
10900	4.3	10.4	5712	13814
11000	4.3	10.4	5817	14069
11100	4.3	10.4	5923	14326
11200	4.3	10.4	6030	14585
11300	4.3	10.4	6139	14847
11400	4.3	10.4	6248	15111
11500	4.3	10.4	6358	15377
11600	4.3	10.4	6469	15646
11700	4.3	10.4	6581	15916
11800	4.3	10.4	6694	16190
11900	4.3	10.4	6808	16465
12000	4.3	10.4	6923	16743
12100	4.3	10.4	7039	17023
12200	4.3	10.4	7155	17306
12300	4.3	10.4	7273	17591
12400	4.3	10.4	7392	17878
12500	4.3	10.4	7512	18168
12600	4.3	10.4	7632	18459
12700	4.3	10.4	7754	18754
12800	4.3	10.4	7876	19050
12900	4.3	10.4	8000	19349
13000	4.3	10.4	8125	19650
13100	4.3	10.4	8250	19953
13200	4.3	10.4	8376	20259
13300	4.3	10.4	8504	20567
13400	4.3	10.4	8632	20878
13500	4.3	10.4	8761	21191
13600	4.3	10.4	8892	21506
13700	4.3	10.4	9023	21823
13800	4.3	10.4	9155	22143
13900	4.3	10.4	9288	22465
14000	4.3	10.4	9423	22789
14100	4.3	10.4	9558	23116

Speed (rpm)	R_{min}	R_{max}	RCF R_{min}	RCF R_{max}
14200	4.3	10.4	9694	23445
14300	4.3	10.4	9831	23776
14400	4.3	10.4	9969	24110
14500	4.3	10.4	10108	24446

Chemical Compatibility Chart

CHEMICAL	MATERIAL	ALUMINUM	ANODIC COATING for ALUMINUM	BUNA N	CELLULOSE ACETATE BUTYRATE	POLYURETHANE ROTOR PAINT	COMPOSITE Carbon Fiber/Epoxy	DELRIN®	ETHYLENE PROPYLENE	GLASS	NEOPRENE	NORYL®	NYLON	PET*, POLYCLEAR®, CLEARCRIMP®CCCLEARCRIMP®	POLYALLOMER	POLYCARBONATE	POLYESTER, GLASS THERMOSET	POLYTHERMIDE	POLYRTHYLENE	POLYPROPYLENE	POLYSULFONE	POLYVINYL CHLORIDE	RULON A®, TEFLON®	SILICONE RUBBER	STAINLESS STEEL	TITANIUM	TYGON®	VITON®
2-mercaptoethanol		S	S	U	-	S	M	S	-	S	U	S	S	U	S	S	-	S	S	S	S	U	S	S	S	S	S	S
Acetaldehyde		S	-	U	U	-	-	-	M	-	U	-	-	-	M	U	U	U	M	M	-	M	S	U	-	S	-	U
Acetone		M	S	U	U	S	U	M	S	S	U	U	S	U	S	U	U	U	S	S	U	U	S	M	M	S	U	U
Acetonitrile		S	S	U	-	S	M	S	-	S	S	U	S	U	M	U	U	-	S	M	U	U	S	S	S	S	U	U
Alconox®		U	U	S	-	S	S	S	-	S	S	S	S	S	S	M	S	S	S	S	S	S	S	S	S	S	S	U
Allyl Alcohol		-	-	-	U	-	-	S	-	-	-	-	S	-	S	S	M	S	S	S	-	M	S	-	-	S	-	-
Aluminum Chloride		U	U	S	S	S	S	U	S	S	S	S	M	S	S	S	S	-	S	S	S	S	S	M	U	U	S	S
Formic Acid (100%)		-	S	M	U	-	-	U	-	-	-	-	U	-	S	M	U	U	S	S	-	U	S	-	U	S	-	U
Ammonium Acetate		S	S	U	-	S	S	S	-	S	S	S	S	S	S	S	U	-	S	S	S	S	S	S	S	S	S	S
Ammonium Carbonate		M	S	U	S	S	S	S	S	S	S	S	S	S	S	U	U	-	S	S	S	S	S	S	M	S	S	S
Ammonium Hydroxide (10%)		U	U	S	U	S	S	M	S	S	S	S	S	-	S	U	M	S	S	S	S	S	S	S	S	S	M	S
Ammonium Hydroxide (28%)		U	U	S	U	S	U	M	S	S	S	S	S	U	S	U	M	S	S	S	S	S	S	S	S	S	M	S
Ammonium Hydroxide (conc.)		U	U	U	U	S	U	M	S	-	S	-	S	U	S	U	U	S	S	S	-	M	S	S	S	S	-	U
Ammonium Phosphate		U	-	S	-	S	S	S	S	S	S	S	S	-	S	S	M	-	S	S	S	S	S	S	M	S	S	S
Ammonium Sulfate		U	M	S	-	S	S	U	S	S	S	S	S	S	S	S	S	-	S	S	S	S	S	S	U	S	S	U
Amyl Alcohol		S	-	M	U	-	-	S	S	-	M	-	S	-	M	S	S	S	S	M	-	-	-	U	-	S	-	M
Aniline		S	S	U	U	S	U	S	M	S	U	U	U	U	U	U	U	-	S	M	U	U	S	S	S	S	U	S
Sodium Hydroxide (<1%)		U	-	M	S	S	S	-	-	S	M	S	S	-	S	M	M	S	S	S	S	S	S	M	S	S	-	U
Sodium Hydroxide (10%)		U	-	M	U	-	-	U	-	M	M	S	S	U	S	U	U	S	S	S	S	S	S	M	S	S	-	U
Barium Salts		M	U	S	-	S	S	S	S	S	S	S	S	S	S	S	M	-	S	S	S	S	S	S	M	S	S	S
Benzene		S	S	U	U	S	U	M	U	S	U	U	S	U	U	U	M	U	M	U	U	U	S	U	U	S	U	S

CHEMICAL	MATERIAL	ALUMINUM	ANODIC COATING for ALUMINUM	BUNA N	CELLULOSE ACETATE BUTYRATE	POLYURETHANE ROTOR PAINT	COMPOSITE Carbon Fiber/Epoxy	DELRIN®	ETHYLENE PROPYLENE	GLASS	NEOPRENE	NORYL®	NYLON	PET*, POLYCLEAR®, CLEARCRIMP®CCCLEARCRIMP®	POLYALLOMER	POLYCARBONATE	POLYESTER, GLASS THERMOSET	POLYTHERMIDE	POLYTHYLENE	POLYPROPYLENE	POLYSULFONE	POLYVINYL CHLORIDE	RULON A®, TEFLON®	SILICONE RUBBER	STAINLESS STEEL	TITANIUM	TYGON®	VITON®
Benzyl Alcohol		S	-	U	U	-	-	M	M	-	M	-	S	U	U	U	U	U	U	U	-	M	S	M	-	S	-	S
Boric Acid		U	S	S	M	S	S	U	S	S	S	S	S	S	S	S	S	U	S	S	S	S	S	S	S	S	S	S
Cesium Acetate		M	-	S	-	S	S	S	-	S	S	S	S	-	S	S	-	-	S	S	S	S	S	S	M	S	S	S
Cesium Bromide		M	S	S	-	S	S	S	-	S	S	S	S	S	S	S	-	-	S	S	S	S	S	S	M	S	S	S
Cesium Chloride		M	S	S	U	S	S	S	-	S	S	S	S	S	S	S	-	-	S	S	S	S	S	S	M	S	S	S
Cesium Formate		M	S	S	-	S	S	S	-	S	S	S	S	S	S	S	-	-	S	S	S	S	S	S	M	S	S	S
Cesium Iodide		M	S	S	-	S	S	S	-	S	S	S	S	S	S	S	-	-	S	S	S	S	S	S	M	S	S	S
Cesium Sulfate		M	S	S	-	S	S	S	-	S	S	S	S	S	S	S	-	-	S	S	S	S	S	S	M	S	S	S
Chloroform		U	U	U	U	S	S	M	U	S	U	U	M	U	M	U	U	U	M	M	U	U	S	U	U	U	M	S
Chromic Acid (10%)		U	-	U	U	S	U	U	-	S	S	S	U	S	S	M	U	M	S	S	U	M	S	M	U	S	S	S
Chromic Acid (50%)		U	-	U	U	-	U	U	-	-	-	S	U	U	S	M	U	M	S	S	U	M	S	-	U	M	-	S
Cresol Mixture		S	S	U	-	-	-	S	-	S	U	U	U	U	U	U	-	-	U	U	-	U	S	S	S	S	U	S
Cyclohexane		S	S	S	-	S	S	S	U	S	U	S	S	U	U	U	M	S	M	U	M	M	S	U	M	M	U	S
Deoxycholate		S	S	S	-	S	S	S	-	S	S	S	S	S	S	S	-	-	S	S	S	S	S	S	S	S	S	S
Distilled Water		S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
Dextran		M	S	S	S	S	S	S	-	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	M	S	S	S
Diethyl Ether		S	S	U	U	S	S	S	U	S	U	U	S	U	U	U	U	U	U	U	U	U	S	S	S	S	M	U
Diethyl Ketone		S	-	U	U	-	-	M	-	S	U	-	S	-	M	U	U	U	M	M	-	U	S	-	-	S	U	U
Diethylpyrocarbonate		S	S	U	-	S	S	S	-	S	S	U	S	U	S	U	-	-	S	S	S	M	S	S	S	S	S	S
Dimethylsulfoxide		S	S	U	U	S	S	S	-	S	U	S	S	U	S	U	U	-	S	S	U	U	S	S	S	S	U	U
Dioxane		M	S	U	U	S	S	M	M	S	U	U	S	U	M	U	U	-	M	M	M	U	S	S	S	S	U	U
Ferric Chloride		U	U	S	-	-	-	M	S	-	M	-	S	-	S	-	-	-	S	S	-	-	-	M	U	S	-	S
Acetic Acid (Glacial)		S	S	U	U	S	S	U	M	S	U	S	U	U	U	U	U	M	S	U	M	U	S	U	U	S	-	U
Acetic Acid (5%)		S	S	M	S	S	S	M	S	S	S	S	S	M	S	S	S	S	S	S	S	M	S	S	M	S	S	M
Acetic Acid (60%)		S	S	U	U	S	S	U	-	S	M	S	U	U	M	U	S	M	S	M	S	M	S	M	U	S	M	U
Ethyl Acetate		M	M	U	U	S	S	M	M	S	S	U	S	U	M	U	U	-	S	S	U	U	S	M	M	S	U	U
Ethyl Alcohol (50%)		S	S	S	S	S	S	M	S	S	S	S	S	U	S	U	S	S	S	S	S	S	S	S	M	S	M	U
Ethyl Alcohol (95%)		S	S	S	U	S	S	M	S	S	S	S	S	U	S	U	-	S	S	S	M	S	S	S	U	S	M	U
Ethylene Dichloride		S	-	U	U	-	-	S	M	-	U	U	S	U	U	U	U	U	U	U	-	U	S	U	-	S	-	S
Ethylene Glycol		S	S	S	S	S	S	S	S	S	S	S	S	-	S	U	S	S	S	S	S	S	S	S	M	S	M	S

CHEMICAL	MATERIAL	ALUMINUM	ANODIC COATING for ALUMINUM	BUNA N	CELLULOSE ACETATE BUTYRATE	POLYURETHANE ROTOR PAINT	COMPOSITE Carbon Fiber/Epoxy	DELRIN®	ETHYLENE PROPYLENE	GLASS	NEOPRENE	NORYL®	NYLON	PET*, POLYCLEAR®, CLEARCRIMP®CCCLEARCRIMP®	POLYALLOMER	POLYCARBONATE	POLYESTER, GLASS THERMOSET	POLYTHERMIDE	POLYRTHYLENE	POLYPROPYLENE	POLYSULFONE	POLYVINYL CHLORIDE	RULON A®, TEFLON®	SILICONE RUBBER	STAINLESS STEEL	TITANIUM	TYGON®	VITON®
Ethylene Oxide Vapor		S	-	U	-	-	U	-	-	S	U	-	S	-	S	M	-	-	S	S	S	U	S	U	S	S	S	U
Ficoll-Hypaque®		M	S	S	-	S	S	S	-	S	S	S	S	-	S	S	-	S	S	S	S	S	S	S	M	S	S	S
Hydrofluoric Acid (10%)		U	U	U	M	-	-	U	-	-	U	U	S	-	S	M	U	S	S	S	S	M	S	U	U	U	-	-
Hydrofluoric Acid (50%)		U	U	U	U	-	-	U	-	-	U	U	U	U	S	U	U	U	S	S	M	M	S	U	U	U	-	M
Hydrochloric Acid (conc.)		U	U	U	U	-	U	U	M	-	U	M	U	U	M	U	U	U	-	S	-	U	S	U	U	U	-	-
Formaldehyde (40%)		M	M	M	S	S	S	S	M	S	S	S	S	M	S	S	S	U	S	S	M	S	S	S	M	S	M	U
Glutaraldehyde		S	S	S	S	-	-	S	-	S	S	S	S	S	S	S	-	-	S	S	S	-	-	S	S	S	-	-
Glycerol		M	S	S	-	S	S	S	S	S	S	S	S	S	S	S	S	-	S	S	S	S	S	S	S	S	S	S
Guanidine Hydrochloride		U	U	S	-	S	S	S	-	S	S	S	S	S	S	S	-	-	S	S	S	S	S	S	U	S	S	S
Haemo-Sol®		S	S	S	-	-	-	S	-	S	S	S	S	S	S	S	-	-	S	S	S	S	S	S	S	S	S	S
Hexane		S	S	S	-	S	S	S	-	S	S	U	S	U	M	U	S	S	U	S	S	M	S	U	S	S	U	S
Isobutyl Alcohol		-	-	M	U	-	-	S	S	-	U	-	S	U	S	S	M	S	S	S	-	S	S	S	-	S	-	S
Isopropyl Alcohol		M	M	M	U	S	S	S	S	S	U	S	S	U	S	U	M	S	S	S	S	S	S	S	M	M	M	S
Iodoacetic Acid		S	S	M	-	S	S	S	-	S	M	S	S	M	S	S	-	M	S	S	S	S	S	M	S	S	M	M
Potassium Bromide		U	S	S	-	S	S	S	-	S	S	S	S	S	S	S	S	S	S	S	-	S	S	S	M	S	S	S
Potassium Carbonate		M	U	S	S	S	S	S	-	S	S	S	S	S	S	U	S	S	S	S	S	S	S	S	S	S	S	S
Potassium Chloride		U	S	S	-	S	S	S	S	S	S	S	S	S	S	S	-	S	S	S	S	S	S	S	U	S	S	S
Potassium Hydroxide (5%)		U	U	S	S	S	S	M	-	S	S	S	S	-	S	U	S	S	S	S	S	S	S	M	U	M	S	U
Potassium Hydroxide (conc.)		U	U	M	U	-	-	M	-	M	S	S	-	U	M	U	U	U	S	M	-	M	U	-	U	U	-	U
Potassium Permanganate		S	S	S	-	S	S	S	-	S	S	S	U	S	S	S	M	-	S	M	S	U	S	S	M	S	U	S
Calcium Chloride		M	U	S	S	S	S	S	S	S	S	S	S	S	S	M	S	-	S	S	S	S	S	S	M	S	S	S
Calcium Hypochlorite		M	-	U	-	S	M	M	S	-	M	-	S	-	S	M	S	-	S	S	S	M	S	M	U	S	-	S
Kerosene		S	S	S	-	S	S	S	U	S	M	U	S	U	M	M	S	-	M	M	M	S	S	U	S	S	U	S
Sodium Chloride (10%)		S	-	S	S	S	S	S	S	-	-	-	S	S	S	S	S	-	S	S	S	S	-	S	S	M	-	S
Sodium Chloride (sat'd)		U	-	S	U	S	S	S	-	-	-	-	S	S	S	S	S	-	S	S	-	S	-	S	S	M	-	S
Carbon Tetrachloride		U	U	M	S	S	U	M	U	S	U	U	S	U	M	U	S	S	M	M	S	M	M	M	M	U	S	S
Aqua Regia		U	-	U	U	-	-	U	-	-	-	-	-	U	U	U	U	U	U	U	-	-	-	-	-	S	-	M
Solution 555 (20%)		S	S	S	-	-	-	S	-	S	S	S	S	S	S	S	-	-	S	S	S	-	S	S	S	S	S	S
Magnesium Chloride		M	S	S	-	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	M	S	S	S
Mercaptoacetic Acid		U	S	U	-	S	M	S	-	S	M	S	U	U	U	U	-	S	U	U	S	M	S	U	S	S	S	S

CHEMICAL	MATERIAL	ALUMINUM	ANODIC COATING for ALUMINUM	BUNA N	CELLULOSE ACETATE BUTYRATE	POLYURETHANE ROTOR PAINT	COMPOSITE Carbon Fiber/Epoxy	DELRIN®	ETHYLENE PROPYLENE	GLASS	NEOPRENE	NORYL®	NYLON	PET*, POLYCLEAR®, CLEARCRIMP®CCCLEARCRIMP®	POLYALLOMER	POLYCARBONATE	POLYESTER, GLASS THERMOSET	POLYTHERMIDE	POLYTHYLENE	POLYPROPYLENE	POLYSULFONE	POLYVINYL CHLORIDE	RULON A®, TEFLON®	SILICONE RUBBER	STAINLESS STEEL	TITANIUM	TYGON®	VITON®
Methyl Alcohol		S	S	S	U	S	S	M	S	S	S	S	S	U	S	U	M	S	S	S	S	S	S	S	M	S	M	U
Methylene Chloride		U	U	U	U	M	S	S	U	S	U	U	S	U	U	U	U	U	M	U	U	U	S	S	M	U	S	U
Methyl Ethyl Ketone		S	S	U	U	S	S	M	S	S	U	U	S	U	S	U	U	U	S	S	U	U	S	S	S	S	U	U
Metrizamide®		M	S	S	-	S	S	S	-	S	S	S	S	-	S	S	-	-	S	S	S	S	S	S	M	S	S	S
Lactic Acid (100%)		-	-	S	-	-	-	-	-	-	M	S	U	-	S	S	S	M	S	S	-	M	S	M	S	S	-	S
Lactic Acid (20%)		-	-	S	S	-	-	-	-	-	M	S	M	-	S	S	S	S	S	S	S	M	S	M	S	S	-	S
N-Butyl Alcohol		S	-	S	U	-	-	S	-	-	S	M	-	U	S	M	S	S	S	S	M	M	S	M	-	S	-	S
N-Butyl Phthalate		S	S	U	-	S	S	S	-	S	U	U	S	U	U	U	M	-	U	U	S	U	S	M	M	S	U	S
N, N-Dimethylformamide		S	S	S	U	S	M	S	-	S	S	U	S	U	S	U	U	-	S	S	U	U	S	M	S	S	S	U
Sodium Borate		M	S	S	S	S	S	S	S	S	S	S	U	S	S	S	S	-	S	S	S	S	S	S	M	S	S	S
Sodium Bromide		U	S	S	-	S	S	S	-	S	S	S	S	S	S	S	S	-	S	S	S	S	S	S	M	S	S	S
Sodium Carbonate (2%)		M	U	S	S	S	S	S	S	S	S	S	S	S	S	U	S	S	S	S	S	S	S	S	S	S	S	S
Sodium Dodecyl Sulfate		S	S	S	-	S	S	S	-	S	S	S	S	S	S	S	-	S	S	S	S	S	S	S	S	S	S	S
Sodium Hypochlorite (5%)		U	U	M	S	S	M	U	S	S	M	S	S	S	M	S	S	S	S	M	S	S	S	M	U	S	M	S
Sodium Iodide		M	S	S	-	S	S	S	-	S	S	S	S	S	S	S	-	-	S	S	S	S	S	S	M	S	S	S
Sodium Nitrate		S	S	S	-	S	S	S	S	S	S	S	S	S	S	S	S	-	S	S	S	S	S	U	S	S	S	S
Sodium Sulfate		U	S	S	-	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	M	S	S	S
Sodium Sulfide		S	-	S	S	-	-	-	S	-	-	-	S	S	S	U	U	-	-	S	-	-	-	S	S	M	-	S
Sodium Sulfite		S	S	S	-	S	S	S	S	M	S	S	S	S	S	S	M	-	S	S	S	S	S	S	S	S	S	S
Nickel Salts		U	S	S	S	S	S	-	S	S	S	-	-	S	S	S	S	-	S	S	S	S	S	S	M	S	S	S
Oils (Petroleum)		S	S	S	-	-	-	S	U	S	S	S	S	U	U	M	S	M	U	U	S	S	S	U	S	S	S	S
Oils (Other)		S	-	S	-	-	-	S	M	S	S	S	S	U	S	S	S	S	U	S	S	S	S	-	S	S	M	S
Oleic Acid		S	-	U	S	S	S	U	U	S	U	S	S	M	S	S	S	S	S	S	S	S	S	M	U	S	M	M
Oxalic Acid		U	U	M	S	S	S	U	S	S	S	S	S	U	S	U	S	S	S	S	S	S	S	S	U	M	S	S
Perchloric Acid (10%)		U	-	U	-	S	U	U	-	S	M	M	-	-	M	U	M	S	M	M	-	M	S	U	-	S	-	S
Perchloric Acid (70%)		U	U	U	-	-	U	U	-	S	U	M	U	U	M	U	U	U	M	M	U	M	S	U	U	S	U	S
Phenol (5%)		U	S	U	-	S	M	M	-	S	U	M	U	U	S	U	M	S	M	S	U	U	S	U	M	M	M	S
Phenol (50%)		U	S	U	-	S	U	M	-	S	U	M	U	U	U	U	U	S	U	M	U	U	S	U	U	U	M	S
Phosphoric Acid (10%)		U	U	M	S	S	S	U	S	S	S	S	U	-	S	S	S	S	S	S	S	S	S	U	M	U	S	S
Phosphoric Acid (conc.)		U	U	M	M	-	-	U	S	-	M	S	U	U	M	M	S	S	S	M	S	M	S	U	M	U	-	S

CHEMICAL	MATERIAL	ALUMINUM	ANODIC COATING for ALUMINUM	BUNA N	CELLULOSE ACETATE BUTYRATE	POLYURETHANE ROTOR PAINT	COMPOSITE Carbon Fiber/Epoxy	DELRIN®	ETHYLENE PROPYLENE	GLASS	NEOPRENE	NORYL®	NYLON	PET*, POLYCLEAR®, CLEARCRIMP®CCCLEARCRIMP®	POLYALLOMER	POLYCARBONATE	POLYESTER, GLASS THERMOSET	POLYTHERMIDE	POLYRTHYLENE	POLYPROPYLENE	POLYSULFONE	POLYVINYL CHLORIDE	RULON A®, TEFLON®	SILICONE RUBBER	STAINLESS STEEL	TITANIUM	TYGON®	VITON®
Physiologic Media (Serum, Urine)		M	S	S	S	-	-	S	-	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
Picric Acid		S	S	U	-	S	M	S	S	S	M	S	U	S	S	S	U	S	S	S	S	U	S	U	M	S	M	S
Pyridine (50%)		U	S	U	U	S	U	U	-	U	S	S	U	U	M	U	U	-	U	S	M	U	S	S	U	U	U	U
Rubidium Bromide		M	S	S	-	S	S	S	-	S	S	S	S	S	S	S	-	-	S	S	S	S	S	S	M	S	S	S
Rubidium Chloride		M	S	S	-	S	S	S	-	S	S	S	S	S	S	S	-	-	S	S	S	S	S	S	M	S	S	S
Sucrose		M	S	S	-	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
Sucrose, Alkaline		M	S	S	-	S	S	S	-	S	S	S	S	S	S	U	S	S	S	S	S	S	S	S	M	S	S	S
Sulfosalicylic Acid		U	U	S	S	S	S	S	-	S	S	S	U	S	S	S	-	S	S	S	-	S	S	S	U	S	S	S
Nitric Acid (10%)		U	S	U	S	S	U	U	-	S	U	S	U	-	S	S	S	S	S	S	S	S	S	M	S	S	S	S
Nitric Acid (50%)		U	S	U	M	S	U	U	-	S	U	S	U	U	M	M	U	M	M	M	S	S	S	U	S	S	M	S
Nitric Acid (95%)		U	-	U	U	-	U	U	-	-	U	U	U	U	M	U	U	U	U	M	U	U	S	U	S	S	-	S
Hydrochloric Acid (10%)		U	U	M	S	S	S	U	-	S	S	S	U	U	S	U	S	S	S	S	S	S	S	S	U	M	S	S
Hydrochloric Acid (50%)		U	U	U	U	S	U	U	-	S	M	S	U	U	M	U	U	S	S	S	S	M	S	M	U	U	M	M
Sulfuric Acid (10%)		M	U	U	S	S	U	U	-	S	S	M	U	S	S	S	S	S	S	S	S	S	S	U	U	U	S	S
Sulfuric Acid (50%)		M	U	U	U	S	U	U	-	S	S	M	U	U	S	U	U	M	S	S	S	S	S	U	U	U	M	S
Sulfuric Acid (conc.)		M	U	U	U	-	U	U	M	-	-	M	U	U	S	U	U	U	M	S	U	M	S	U	U	U	-	S
Stearic Acid		S	-	S	-	-	-	S	M	S	S	S	S	-	S	S	S	S	S	S	S	S	S	M	M	S	S	S
Tetrahydrofuran		S	S	U	U	S	U	U	M	S	U	U	S	U	U	U	-	M	U	U	U	U	S	U	S	S	U	U
Toluene		S	S	U	U	S	S	M	U	S	U	U	S	U	U	U	S	U	M	U	U	U	S	U	S	U	U	M
Trichloroacetic Acid		U	U	U	-	S	S	U	M	S	U	S	U	U	S	M	-	M	S	S	U	U	S	U	U	U	M	U
Trichloroethane		S	-	U	-	-	-	M	U	-	U	-	S	U	U	U	U	U	U	U	U	U	S	U	-	S	-	S
Trichloroethylene		-	-	U	U	-	-	-	U	-	U	-	S	U	U	U	U	U	U	U	U	U	S	U	-	U	-	S
Trisodium Phosphate		-	-	-	S	-	-	M	-	-	-	-	-	-	S	-	-	S	S	S	-	-	S	-	-	S	-	S
Tris Buffer (neutral pH)		U	S	S	S	S	S	S	-	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
Triton X-100®		S	S	S	-	S	S	S	-	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
Urea		S	-	U	S	S	S	S	-	-	-	-	S	S	S	M	S	S	S	S	-	S	S	S	M	S	-	S
Hydrogen Peroxide (10%)		U	U	M	S	S	U	U	-	S	S	S	U	S	S	S	M	U	S	S	S	S	S	S	M	S	U	S
Hydrogen Peroxide (3%)		S	M	S	S	S	-	S	-	S	S	S	S	S	S	S	S	M	S	S	S	S	S	S	S	S	S	S
Xylene		S	S	U	S	S	S	M	U	S	U	U	U	U	U	U	M	U	M	U	U	U	S	U	M	S	U	S
Zinc Chloride		U	U	S	S	S	S	U	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	U	S	S	S

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Zinc Sulfate		U	S	S	-	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
Citric Acid (10%)		M	S	S	M	S	S	M	S	S	S	S	S	S	S	S	S	M	S	S	S	S	S	S	S	S	S	S

*Polyethyleneterephthalate

Key

S Satisfactory

M = Moderate attack, may be satisfactory for use in centrifuge depending on length of exposure, speed involved, etc.; suggest testing under actual conditions of use.

U Unsatisfactory, not recommended.

-- Performance unknown; suggest testing, using sample to avoid loss of valuable material.

Chemical resistance data is included only as a guide to product use. Because no organized chemical resistance data exists for materials under the stress of centrifugation, when in doubt we recommend pretesting sample lots.

Warranty and recommended Service Life

Rotor Type	Warranty Years	Recommended Retirement After Years
FIBER*Lite* ™ F15-8x50c	15	-

Rotor Type	Warranty	Recommended Retirement After Years
O-ringe, tubes, bottles	30 Days	1

Thermo Fisher Scientific warrants that the Products will operate substantially in conformity with Thermo Fisher Scientific's published specifications, when subjected to normal, proper and intended usage by properly trained personnel, for a period of 5 YEARS after shipment to the Customer (the "Warranty Period"). Thermo Fisher Scientific agrees during the Warranty Period, provided it is promptly notified in writing upon the discovery of any material defect and further provided that all costs of returning the defective Goods to Thermo Fisher Scientific are pre-paid by the Customer, to repair or replace, at Thermo Fisher Scientific's option, defective Goods so as to cause the same to operate in substantial conformance with the said specifications. Replacement parts may be new or refurbished, at the election of Thermo Fisher Scientific. All replaced parts shall become the property of Thermo Fisher Scientific. Thermo Fisher Scientific's sole liability with respect to equipment, materials, parts or software furnished to Thermo Fisher Scientific by its third party suppliers shall be limited to the assignment by Thermo Fisher Scientific to the Customer of any such third party supplier's warranty, to the extent the same is assignable. In no event shall Thermo Fisher Scientific have any obligation to make repairs, replacements or corrections required, in whole or in part, as the result of: (i) normal wear and tear, (ii.) accident, disaster or event of force majeure, (iii) misuse, fault or negligence of or by or on behalf of the Customer, (iv) use of the Goods in a manner for which they were not designed, (v) causes external to the Goods such as, but not limited to, power failure or electrical power surges or (vi) use of the Goods in combination with equipment or software not supplied by Thermo Fisher Scientific. If Thermo Fisher Scientific determines that Goods for which the Customer has requested warranty services are not covered by the warranty hereunder, the Customer shall pay or reimburse Thermo Fisher Scientific for all costs of investigating and responding to such request at Thermo Fisher Scientific's then prevailing time and material rates. If Thermo Fisher Scientific provides repair services or replacement parts that are not covered by the warranty provided in this Clause, the Customer shall pay Thermo Fisher Scientific therefor at Thermo Fisher Scientific's then prevailing time and materials rates. Any installation, maintenance, repair, service, relocation or alteration to or of, or other tampering with, the Goods, performed by any person or entity other than Thermo Fisher Scientific without Thermo Fisher Scientific's prior written approval, or any use of replacement parts not supplied by Thermo Fisher Scientific, shall immediately void and cancel all warranties with respect to the affected Goods.

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